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An Illustrated Weekly Review of the Mechanical Press of the World

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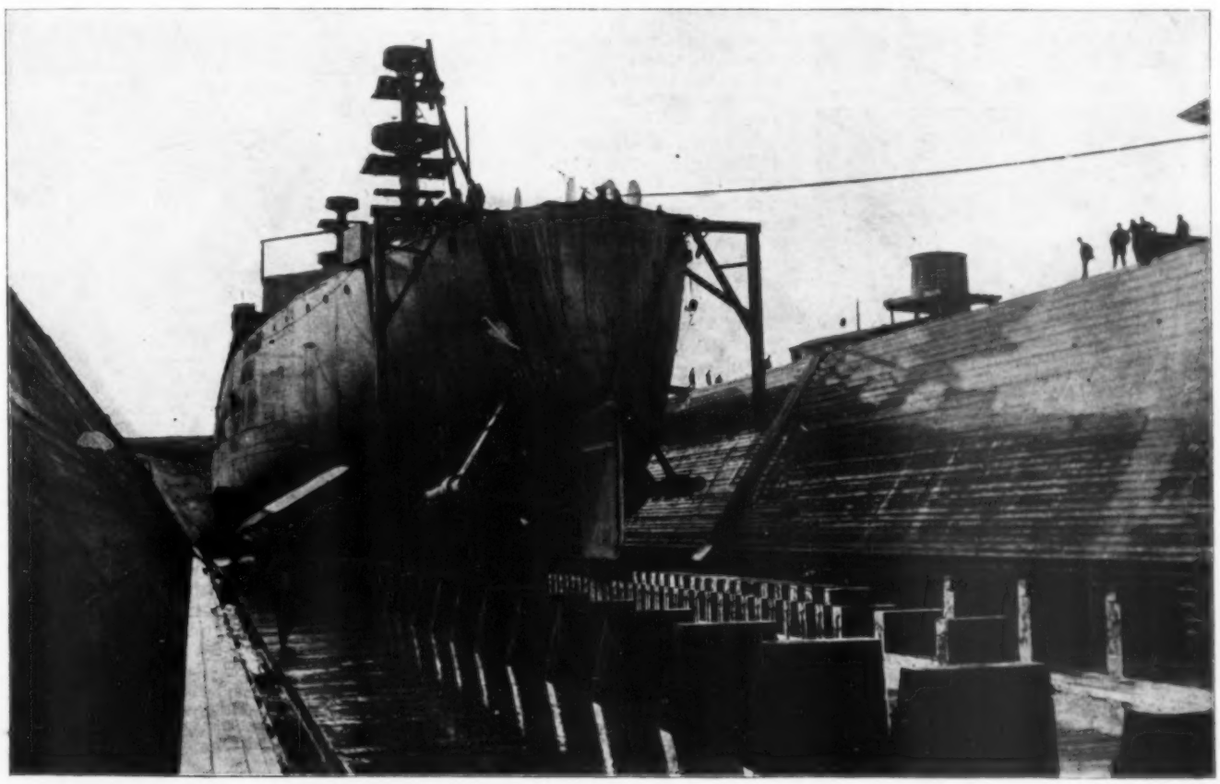
Smithsonian Institution

Vol. 3. No. 13. CHICAGO, MARCH 28, 1903. PRICE 5 CENTS.

Battleship Ohio in America's Largest Dry Dock



Giant "Baby of the Deep" in Its Mammoth Cradle at San Francisco--First Vessel Docked in the New Basin

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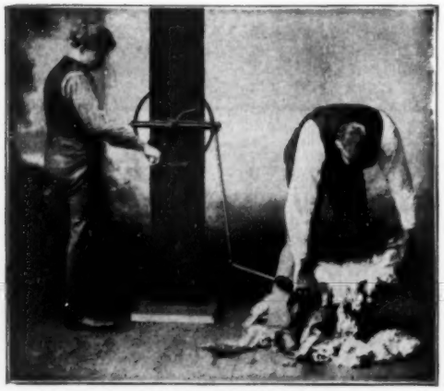
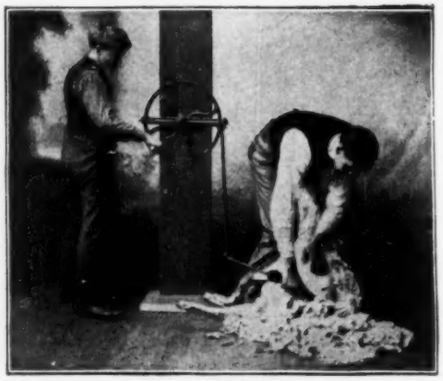
MAR 26 1903
SMITHSONIAN DEPOSIT

Shearing Sheep by Machinery

Works Wonderful Changes Down on the Farm



Beginning the Shearing



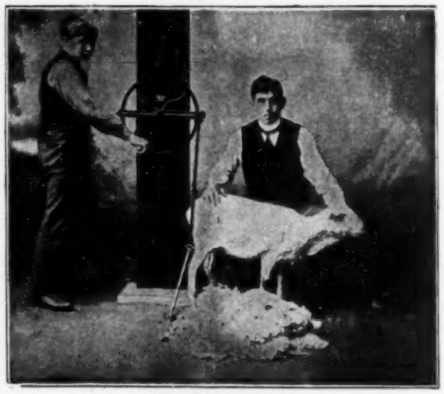
When Half Through

Machines for milking cows, and sheep shearing machinery are working wonderful changes in the scenes and customs of our former farm life. No up-to-date sheep ranchman would be without his shearing outfit now, any more than a seamstress would try to make garments without the aid of a sewing machine. It takes away much of the romance from the former associations of the shepherd but it adds money to the coffers of the sheep owner. To say nothing of the wonderful saving in time, from 8 to 24 ounces more wool can be obtained from each sheep by the use of the machine shear. As this extra quantity of wool is that taken next to the hide it is the most valuable part of the fleece.

The sheep shearing machine is the invention of a Chicago firm, the Chicago Flexible Shaft Company, La Salle Avenue and Ontario Streets, which firm is now its largest manufacturers. Four stages in the process of taking the wool from the sheep by means of the machine are shown in the accompanying illustration.

The sheep likes the machine much better than he did the old method of shearing by hand. It makes him look much more presentable when his fleece has been shorn and he is not hacked and gouged with the sheers as he used to be.

Nearing the End



The Sheared Sheep

OHIO IN OUR LARGEST DRY DOCK.

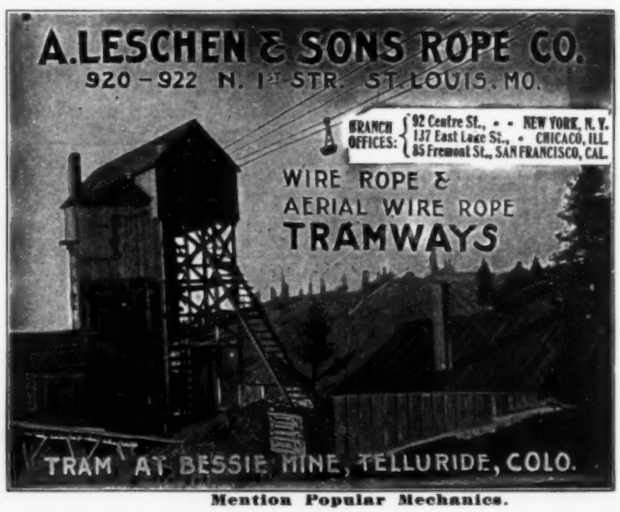
Greatest Basin in American Cradles a Pride of the New Navy

The docking of the great battleship Ohio in the largest dry dock in America was witnessed by a huge gathering of people at San Francisco a few days ago. Colossal as is the Ohio, it seemed swallowed up in this enormous basin, which has just been built by the San Francisco Dry Dock Company There is not in the world an equal to this dock in the way of construction and convenient arrangement. It is 750 feet long, 122 feet wide at the top and 80 feet wide at the top of the keel blocks. There is 28 feet of water over the sill at high tide. Three huge centrifugal pumps are employed in emptying the basin. Each pump is capable of sucking up 40,000 gallons of water per minute. Even at this rate several hours are required to clear the dock.

The Battleship Ohio, which was christened and launched by the late President McKinley, has the honor of being the first vessel to be placed in the new dock. Three powerful tugs were required to tow the vessel to the basin from the ship building yards of the Union Iron Works. The battleship has not been out of water before since being launched in May, 1901, and her hull was filled with barnacles and sea weeds. Her hull is being thoroughly scraped and she is to be treated to several heavy coatings of paint. Her huge twin bronze propellers will also be placed in position in the shafts.

The comparatively small space the battleship seems to occupy in this immense dock, may be noted from the illustration. After she was in position there was plenty of unoccupied space in which could have been docked several other large vessels at the same time.

The new battleship Ohio, is 393 feet long; 72.2 feet wide and drew 17 feet of water. When she passed into the basin there was 11 feet of water between her keel and the dock sill. There were four feet to spare on each side of the vessel at the dock's narrowest point and an unoccupied space of 357 feet between her stern and the dock gate. It required some time to place this iron "baby" of the navy in its giant cradle. The vessel is soon to make its final trial trip. She is considered one of the most formidable war vessels of the "new navy."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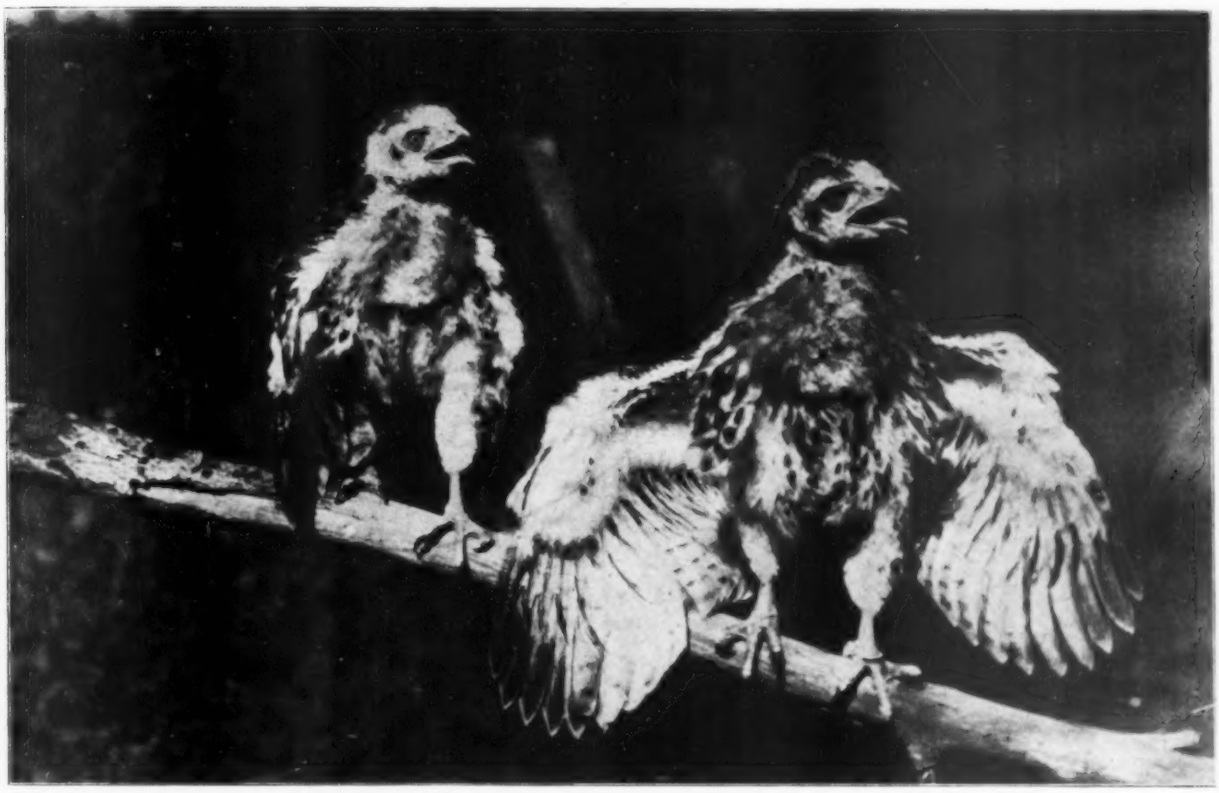
Make Birds Take Their Own Photographs

Wonderful Results Thus Obtained That Will Add Materially to the Science of Ornithology



Young Hawks Photographed by Mother Hawk

Making birds take their own pictures is the latest and most fascinating practice of the ornithologists. By this new process some new and remarkable pictures have been obtained, one of which is shown in the accompanying illustration. The birds are two young chicken hawks, unconsciously photographed by their mother just as she was starting to feed them. The man who arranged the camera for the use of Mrs. Hawk was Robert Hegner, 9203 Pleasant Ave., Chicago. He was disappointed that the mother did not get her physiogomy in the picture. Probably she was too bashful, but like all mothers she would never miss the chance of getting her babies photographed. The other illustration shows Mr. Hegner arranging the camera over the bird's nest so that the mother bird will make a snap shot of herself or her young when she returns.

This process of bird photography is as simple as it is interesting. The camera simply takes the place of a trap only that it does not imprison or harm the bird. The best results are obtained by placing the camera near the nest. A string is stretched from the shutter release across the nest and when the bird steps on or into the nest it pulls the string and takes a snap shot. Even after the young birds are able to leave their abodes they often make the nests their headquarters and return there to get the food brought by the parent bird. This is especially true of hawks and other of the larger birds that build their homes in trees. It was through this weakness for the nest that the splendid picture of the two young hawks, as they are about to be fed, was obtained by Mr. Hegner. Of course the process of taking nest pictures is greatly simplified when the nest is on the ground.

But the nest is not at all an essential in making birds take their own pic-

(Continued on next page.)

STRANGE EXCHANGE OF COMPLIMENTS.

President Roosevelt's Wireless Telegram to King Edward Answered by Cable

The inauguration of the Marconi system by an exchange of compliments between the President of the United States and the King of England developed a strange mixture of the newest and oldest in trans-ocean telegraphy. President Roosevelt sent a pleasant greeting to King Edward over the Marconi air line, but the reply did not get back until the following day, and then it came under the ocean instead of over it, and traveled along a big copper cable in the good old orthodox manner instituted by Cyrus Field.

It appears our message made a rapid and successful journey eastward and landed in Paldhu, the Marconi receiving station, O. K. It was then forwarded on the telegraph lines of the Postoffice Department, and in due course reached His Majesty. The reply was written, but the government lines had gone to bed, and so the royal message had to take its turn and remained on a hook until morning. Then it went forward over one of the ocean cables. The reason for this undignified performance is that the government postal authorities are insanely jealous of the new system and would not recognize it to the extent of delivering a message for transmission.

And so America has all the glory of the first complete wireless message.

The American Society of Mechanical Engineers of New York after a heated debate passed resolutions opposing the metric system.

Lieut. Enestroem, the Swedish aeronaut who attempted to make a balloon voyage from Stockholm to England, has failed. His balloon descended at Randers, Jutland, owing to change of wind and fog and he was compelled to abandon the trip.

Preparing the Camera for the Bird to Take Its Own Picture

tures. They may be made to photograph themselves in the fields, in the yard, on the eaves of houses, on fences and nearly everywhere, by merely baiting the piece of string that leads from the shutter. One late device is to place a piece of fat at the end of a wire electrically connected to the shutter of the camera. Timid birds, like the thrush, will approach the bait and pick it up. At once the shutter is moved by this action and an instantaneous exposure is obtained.

To get photos of nocturnal birds the wire is arranged to light a little magnesium as it releases the shutter. Still another method of getting the pictures of birds in their natural elements is for the photographer to operate the camera himself from a hiding place by means of a string or a long rubber tube. The tube is used where the shutter has a pneumatic release. Food is spread on the ground to attract the birds. By this process the photographer can watch the action of the bird and take the picture at the most desired moment. However, the best results have been obtained by the trap process of making the birds take their own photographs.

Coke is most commonly prepared in ovens called coke ovens, which, when filled with coal, are closed up, excepting an opening for the exit of the gases and a few small holes for admitting air. The coal is ignited at the top, allowed to burn until no further visible smoke is emitted, and then allowed to cool gradually.

Textile mills of Fall River, Mass., are experimenting with paper cop tubes on ring spinning frames, the idea being to use them in place of the bobbins now in use.

AN ECONOMICAL AND CONVENIENT SIRUP FACTORY.

Improved Methods That Would Prevent the Present Wholesale Waste of Cane Juice

By H. W. Wiley, Chief of the Bureau of Chemistry, United States Department of Agriculture

An important problem in connection with the study of table sirups is the improvement of the milling processes in order to secure the largest possible expression of the juice of the canes. At the present time single mills of three rollers each are almost universally employed. The percentage of extraction is low and accurate measurements would probably show that in many cases not more than 60 per cent of the juice contained in the cane is expressed. The juices of sugar cane can be made to comprise about 90 per cent of the total weight of the canes.

The bagasse coming from these primitive mills is entirely too wet to burn effectively. The establishment of milling processes which would leave the bagasse in a condition to be burned would not only increase the total output per ton of cane, but also diminish the expense of manufacture. For the bagasse accumulates and must be removed and it is evident, therefore, that if it can be burned and furnish the heat for manufacturing operations it would be the most economical way of disposing of it.

The addition of antiseptic to the sirups is to be in all cases discouraged as ill advised and possibly injurious to the consumer. Freedom from fermentation should be secured by packing the finished product in such a way as to exclude germs, or if germs be admitted during packing, the final package should be sterilized before being sent to the market.

The practical sirup maker can easily devise a factory arranged in a suitable way to secure his purpose. In order to make some suggestions which may be helpful in a case of this kind I requested Mr. G. L. Spencer of this bureau to prepare a brief outline sketch of a factory for making sirup and as a result of this request the plans in Figs. 1 and 2 have been prepared. It must be understood that the object of these sketches is not

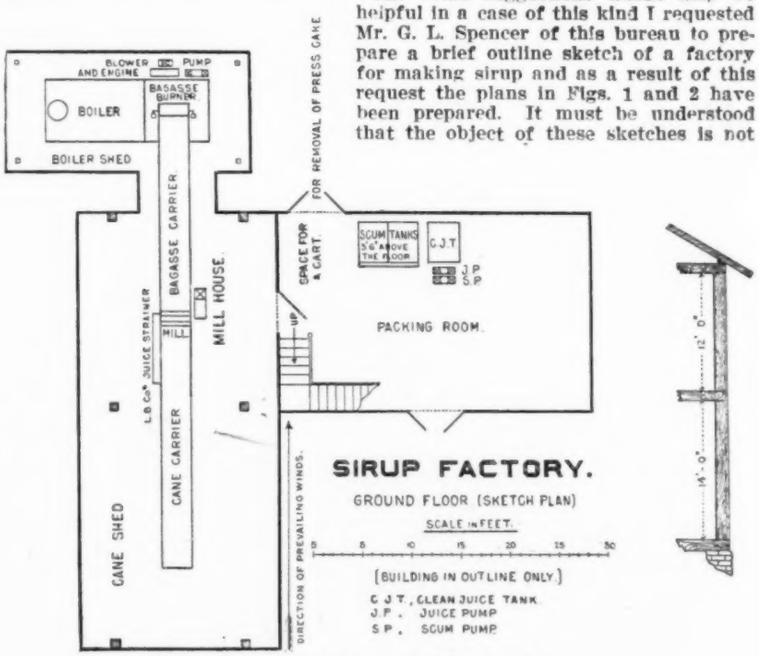


FIG. 1.—Sirup factory, ground floor; sketch plan.

By H. W. Wiley, United States Department of Agriculture

Cane Field of T. J. James, Adrian, Ga., by H. W. Wiley, U. S. Department of Agriculture

to furnish working details for building a sirup factory, but only to give in general an outlined plan of arrangement which will be suggestive to those who may be intending to build a factory with all the modern appliances.

SEA BOTTOM INVESTIGATION FROM BALLOONS.

In his balloon experiments Rev. J. M. Bacon has been able to see the sea-bottom under clear water from a height of 500 ft., all waves seeming to be blotted out, with no apparent scattering of light from the surface. At 1,000 feet or higher, all water—whether deep or not—seemed opaque. Photographs taken during the ascent on a clear day became gradually blurred until at 4,000 feet good pictures were made impossible by the dust particles that reflected the sunshine, the definition over water being better than over land.

Two substances known as "ephthol gold" and "ehpthol silver," consisting of two alloys of tin and copper in extra fine powder, have been successfully employed in England in veterinary practice as a dusting powder to form an impervious and protective covering for freshly made abrasions and wounds.

The Journal de l'Electrolyse of Paris says: The coefficients of resistance of both iron and steel, under all conditions, as of concussion, compression or elongation, are raised from single to double their value by the addition of vanadium even in such minute quantities as 5-10 of 1 per cent.

London has, in proportion to its population, more shade trees than any other large city.

Recent discoveries of graphite near Shasta, Cal., are to be worked on a large scale.

MAKES THE BLIND TO SEE.

Device Said to Transmit Image to the Brain Regardless of Eyes

Prof. Peter Steins of Paris, France, claims to have discovered the secret of restoring sight to the blind. Not only does his process restore lost sight, it is claimed, but gives vision to those who have never seen before.

The Revue des Revues of Paris publishes the report of an experiment performed by Prof. Steins on Dr. Caze. Steins took Caze into a dark room and bandaged his eyes so he could see nothing. He heard the professor walk to and fro, strike a match to light a lamp, and then felt the apparatus fixed around his temples, whereupon he instantly saw a dim light which enabled him to distinguish surrounding objects. Presently the light became stronger and Caze was able to count the professor's fingers when they were held before him and to enumerate other things in the room. Just as he was feeling his vision clearing further and was convinced he would soon see normally Steins suddenly removed the apparatus and Caze was in total darkness.

Stein's claim rests on the theory that a man does not see with his eye but with his brain, the eye only serving to receive the image, which the optic nerve transmits to the seat of perception. If, then, the image be transmitted to the brain without eyes a blind person can see as well as anybody else. The professor's apparatus is on the same scientific basis as a telephone with the substitution of light for sound.

Caze states that several other physicans experimented with the apparatus, but none was able to explain how the astounding results were obtained.

Mica to be used for electrical purposes should be very pure and free from inclusions of oxide of iron and from chisel marks.

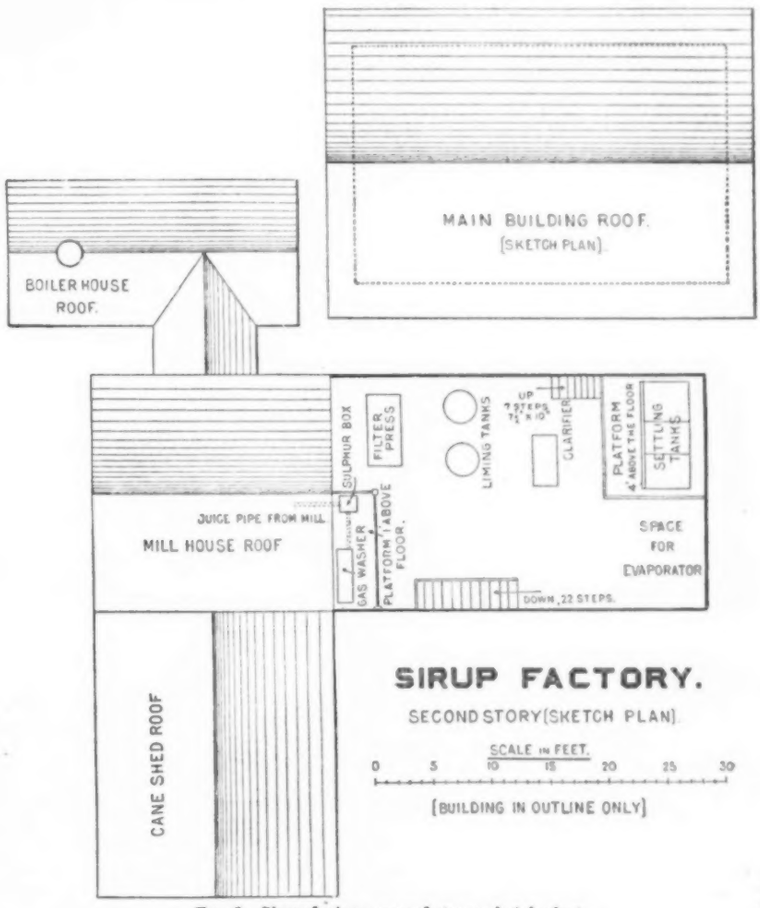


FIG. 2.—Sirup factory, second story; sketch plan.
By H. W. Wiley, U. S. Department of Agriculture

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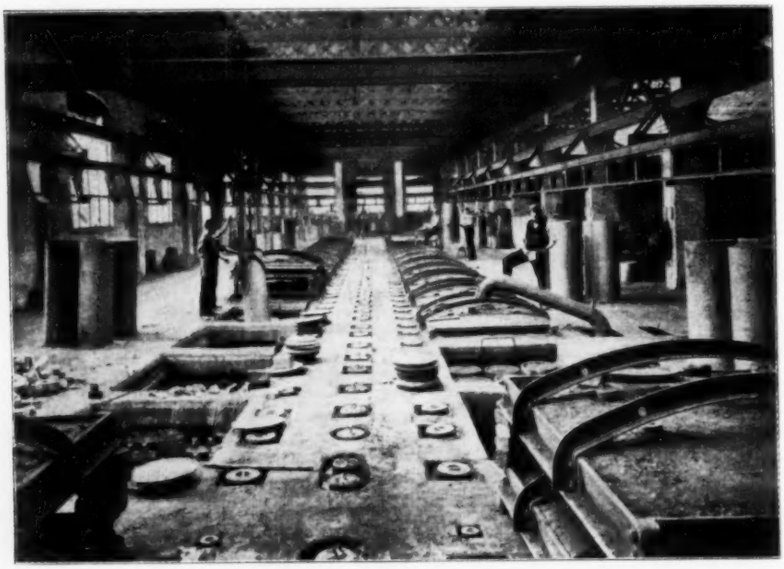
MAKING CARBONS FOR ELECTRIC LIGHTS.

The bright electric arc lights which nightly dispel the darkness in every civilized city of the globe require thousands of tons of "carbons" each year. The manufacture of carbons in the United States and Europe has reached large proportions, but it is only recently that the first factory was put in operation in England. After the ingredients have been ground, mixed and brought into proper shape with great hydraulic presses, the carbons are packed in circular ovens to be baked. The Electrical Review, London, thus describes this department of the new works:

The ovens in which the carbons are baked form one of the most important items in the manufacture of high-class arc lights, and without the latest and most improved economical type it would be an utter impossibility to produce good carbons at the prices which at present very keen competition requires. The ovens cover an enormous area, as will be gathered from the fact that when all are full they contain upwards of 200 tons of manufactured material. The ovens are heated by producer gas, which passes from the generators through a duct running down the center between two rows of ovens, beneath the floor level, as shown in the accompanying illustration; a second set of ovens, for the preliminary baking, is built above ground, and forms the background of the same view.

By means of an ingenious system of water-sealed outlets and movable pipes the gas is admitted to one of a series of ovens, in which it is burnt with air, producing an extremely high temperature, and the hot products of combustion are led away through the succeeding ovens until they are carried off to the chimney, at a comparatively low temperature, by the movable fluel shown in the foreground of the view given above. Thus the whole of the available heat of the gas is utilized. While a range of ovens is being heated in this way, others in advance of the range are being recharged, and those in the rear of it are cooling down. From time to time fresh ovens are brought into the range at the cool end, and others cut off at the hot end, the process being carried on without cessation in an endless cycle. The pots in which the carbons are baked are made on the premises; the illustration shows these, and the method of handling them.



Carbon Works, Range of Ovens

FISHER AUTO-SHOW.

The Fisher Automobile Show at Indianapolis, which will be held from April 6th to 11th, is going to be one of the important events of the year in automobile circles. Exhibits to the value of nearly $100,000 are promised, and the attendance is going to be very large.

The deepest oil well in Colorado has been opened at Florence where a large body of oil was struck at a depth of 3,100 feet.

MAKES SWIMMING EASY.

Pedal Attachment That Adds to the Speed and Buoyancy

An attachment for the feet which will greatly accelerate the progress of a swimmer and at the same time lessen his exertion has been invented by a Massachusetts man. With this appliance it

Swimmer's Pedal Attachment

will be found that the buoyancy is much increased while the bather is in an upright position and treading the water. As will be seen, there is a toe cap, to be slipped over the end of the foot, with an anklet to hold it in place and aid in supporting the rigid bar to which the propelling wings are attached. The wings are operated by the motion of the feet through the water. These wings are hinged on either side of the central support, and when the foot is being drawn up in position for the next stroke the flat blades fold together and offer little or no resistance to the water. When the return movement begins, the water opens the blades and they present a broad, flat surface, with which the swimmer can obtain great leverage on the stroke. As the device is constructed almost entirely of aluminum, the weight is not great enough to inconvenience the wearer when he is walking, and the attachments offer no discomfort while in the water, rather affording greater enjoyment by the increase in speed which is thus made possible.

HOW ALL MAY BECOME RICH.

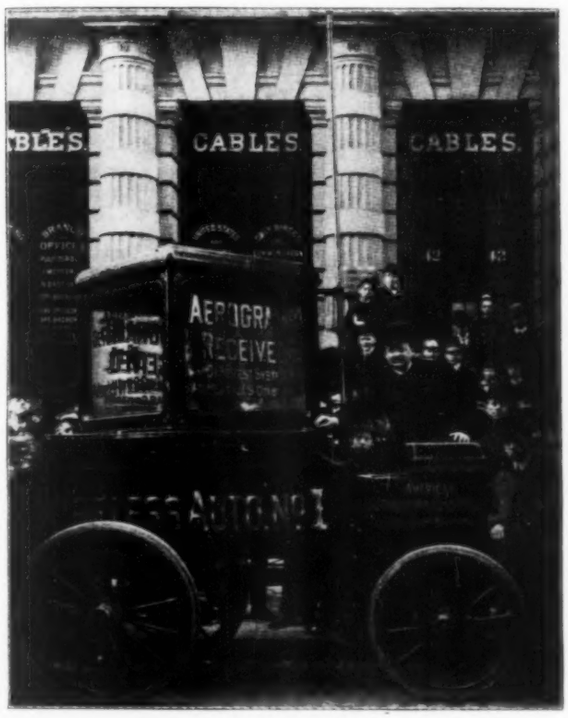
Editor Popular Mechanics:—I thought I would tell you how every one may become rich. The center of the earth is acknowledged to be a molten mass. Now if two liquids of different densities be mixed, the one with the greater density will get as near the centre of the earth as it can, even forcing the lighter one up. Now gold and platinum are at the same time the most precious of metals, as well as the densest of substances. Therefore, the molten gold and platinum in the inner part of the earth must have gradually settled toward the center of the earth, and now, there is a huge mass of the most precious metals on earth at its very center. All one has to do is to pump it up, and his fortune is made. This idea is not copywritten so any one may use it to make his fortune who wants to.

Grover Sexton.

Iola, Wis.

Automobile Wireless Telegraph Stations

All the romance and mystery of the wireless telegraph is rapidly disappearing; in fact, it bids fair to become as commonplace an affair as a banana cart or a popcorn wagon. While Marconi is annihilating ocean space an American has equipped several automobiles with instruments of his system



Automobile Equipped With Wireless Telegraph Outfit

of wireless communication, and offers them for sale to curbstone brokers in New York. The Electrical Age in describing the first of these curious combinations, says:

This vehicle is known as Wireless Automobile Station No. 1 of the American De Forest Wireless Telegraph Company. It consists of the body of an automobile, on which is mounted a large glass case containing the wireless telegraph outfit and the operator. Reaching into the air a distance of 12 or 15 feet is a brass rod about one inch in diameter. This rod takes the place of the usual mast or tower, on top of which is fastened the autennae or collector usually made use of in wireless telegraph operations, and from the collector which surmounts its top the vibrations are sent out, reaching a number of brokerage houses in the vicinity in the form of quotations of the curb market.

The automobile derives its current from a set of 48 cells of storage battery, six cells of which supply the current necessary to operate the wireless instruments. Although in this system the induction coil is dispensed with, one is used in this instance temporarily in conjunction with a two-inch spark coil, giving a spark two inches in length. A later type of automobile station which is now being constructed by the company will be equipped with a motor generator set operated by storage batteries, the pressure of which will be raised to 20,000 volts by means of a step-up transformer.

It is stated that five brokerage houses are now equipped with receiving instruments of this type, and it is claimed that the installation of the wireless service for the transmission of curb quotations means a saving of 15 minutes over the old messenger system. When the lightning-like fluctuations of the stock market are taken into consideration, it will readily be seen that this saving in time is of considerable importance to brokers and their customers. According to the method now in vogue the messengers of the different brokerage houses are posted among the curb brokers, and either deliver the quotations in writing to their concerns or telephone them, but now, with the wireless automobile station, a reporter gives them to the operator in the automobile, who in turn transmits them to the different receiving stations. Among the stations is one in the office of the "Wall Street Journal," which on February 7th published the first wireless curb quotations.

Wireless telegraphy is put to a very severe test in these operations on account of the large amount of steel used in the buildings, the steel acting like so many autennae or receiving wires. The company states that 90 per cent of the current is absorbed by these obstructions, and that 100 feet in the down-town district is equal to one or two miles out in the open country, where interfering objects are very few and far between. At present, on account of the small number of stations, it has been found unnecessary to equip them with masts or poles, but as the service is extended it will probably be found advisable to make use of a short pole, which can be put up outside of the window of each receiving station in the manner of a flagstaff.

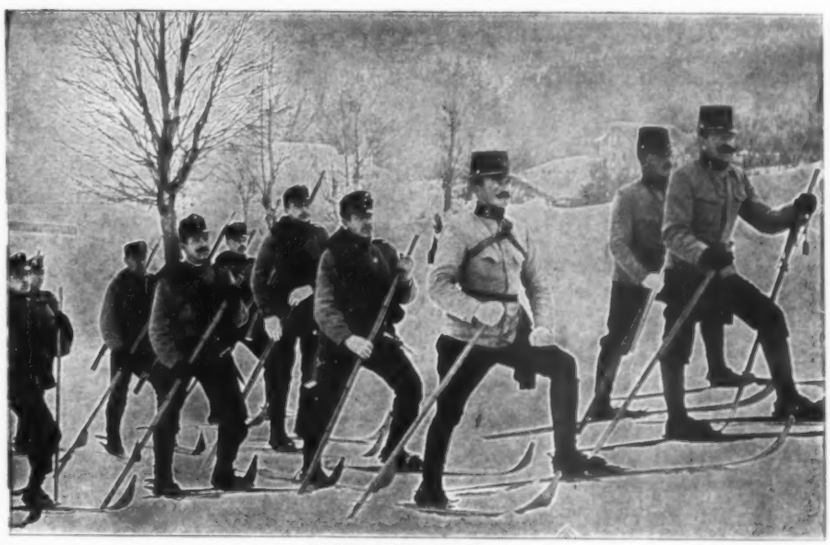
The company is now equipping three additional automobile wireless stations, one of which will be used in Chicago for transmitting curb quotations, and another to be used in Providence.

Ski Drills in the Far North.

The Main Task of the Soldier is to Keep Both Legs Together

The ski drill forms an important feature in military movements in Russia, Norway and other northern European countries where snow and ice abound the greater part of the year. With the aid of the skis the soldiers are enabled to glide over the earth and frozen lakes and streams with wonderful speed, which at times equals that of a passenger train. President True, of the True & True Co., in his European travels has made a collection of pictures of this interesting maneuver, of which the accompanying is the most attractive. The Lumber Review says that the skis are made of very hard and elastic wood and that considerable skill is used in their construction.

It takes much practice to manipulate the ski successfully. The new beginner often finds one foot going one way and one the other and the keeping of both legs together and both skis pointed in the same direction is the great task of the exercise. The staffs held in the hands are used to guide the course of the travelers.



Russian Soldiers on Skis

Easy Electrical Experiments

By L. P. Dickinson

HOW TO MAKE A GYROSCOPE.—II.

In the last chapter the rotating part of our instrument was described consisting of a brass wheel with an extremely heavy rim supported on suitable shaft. The field magnets and supporting frames of this motor will now be described.

A view of the frame is given in Fig. 2 with two of the

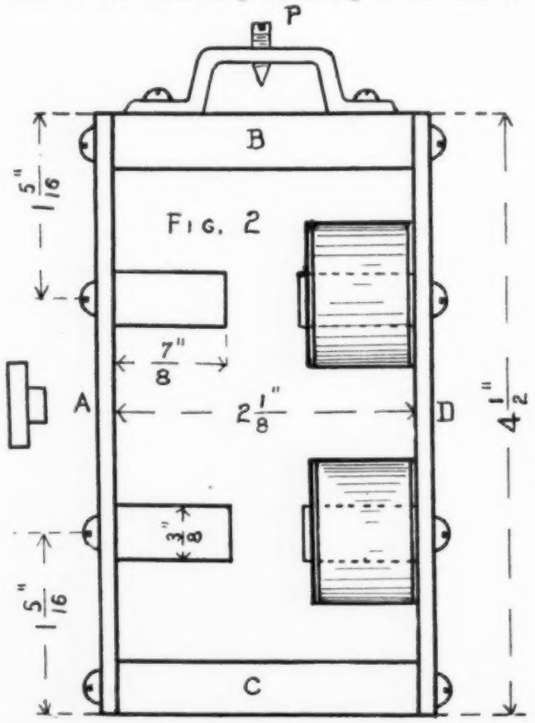


FIG. 2

four coils composing it in place. It consists of two side strips of iron marked A and D which are 4½ inches long, ⅝ inch wide and ⅛ inch thick; the end pieces of the frame C and B being made of pieces of brass ⅜ inch square and 2⅛ inches long. At a distance of 1 5-16 inches from the end of the iron strips, bore two holes 3-16 inch in diameter. These are to support the circular iron cores shown at H. These circular iron cores are of the dimensions given in the figure and are drilled and tapped at one end so as to be fastened to the iron strips by round headed machine screws passing through the holes already drilled. The frame is fastened together at the end by iron screws passing through the strips of iron and into the ends of the brass strips. Extreme care must be taken to see that the frame is rigid, and perfectly balanced throughout. To secure these qualities care should be taken to finish the various strips carefully. After the frame is screwed together bore with a small drill a hole close to the end screws and passing through the iron strips into the brass strips to a depth of ⅜ inch. In these small holes drive a tight fitting pin which will help to prevent racking of the frame.

Coils are next to be wound upon the four inwardly projecting cores. Two of these are shown in the figure, the other two being omitted to make the diagram clearer. Turn out from a piece of brass, eight pieces 1-16 inch thick, and 15-16 inch in diameter, with a hole in the center just big enough so that the disc may be driven tightly upon the circular iron cores, to form heads to contain the wire to be wound upon the cores.

About four ounces of number 30 double silk covered magnet wire will be required. Wind each core with a layer of paper, fastened on with shellac, and cover the inside of the brass head with a paper disc, so that the wire cannot possibly come in contact with the core. Then wind the coils on the four iron cores, so as to make a coil 15-16 inch in diameter. Connect all the coils in series when they are complete, connecting them in such a manner that a north pole of one coil will be opposite to the south pole of the coil opposite.

Before fastening the cores in place to the side strips A and D, bore a hole in the exact center of the two strips A and D, the holes being ¼ inch in diameter. To these holes are to be fitted brass bushings of the shape shown at the left of the figure. These brass bushings are to form bearings for the support of the revolving wheel described in the last chapter, and accordingly must be flush with the surface of the iron on its inner face. The bushings had better be threaded into the iron and fastened by means of a set screw.

We must provide means for supporting the apparatus when it is completed. It is to be supported by being hung upon the steel pivot P. This pivot is threaded into a brass strip ⅜ inch wide bent into the shape shown. In order to exactly balance the machine it will be necessarly probably to exactly this piece of brass a little so that the screws which fasten it to the frame pass through slots cut in the brass instead of through holes.

We are now ready to put the apparatus together, but the description of this will have to be left to the following chapter.

(To be continued.)

FREAK PHOTOGRAPHY THE RAGING FAD.

Strange Looking Pictures Appear as a Result of the New Craze

Freak photography is becoming the fad and all kinds of strange looking pictures are resulting. Men with feet that look as big as a house and heads the size of hickory nuts; a wagon hauling one ear of corn requiring six horses to pull it; pumpkins the size of mountains and men hanging by their toes from a mountain cliff, or skyscrapers are some of the results of the new craze. One of the oddest of the oddities is to show a certain person, eating or drinking or playing cards with himself, the same man appearing in different attitudes two or more times in the same picture. A sample of this style of photography is shown in the accompanying illustration. The picture was taken by a subscriber. There are only two persons pictured here, though six forms appear in the photograph. Three of them are likenesses of the same person. This was accomplished by making three separate exposures, in each of which a portion of the negative was concealed, and after each exposure the parties changed positions.

Another oddity is to make a picture of the person appear as though it were a photograph of an oil portrait. An ordinary mirror is mounted in a picture frame and placed at some little distance from and facing a black cloth, or dark-colored and feebly-lighted wall. A model is posed in front of the picture frame in such a way that his or her reflection

There Are But Two Men in This Picture

by the mirror gives a negative that appears as a representation of a painting, framed. Now, a second "sitter" (one with some artistic pretentions preferred), is posed with pallette and brush before the picture frame (this time having a piece of black cloth stretched over the mirror with which it is filled). Of course, the combination printing now required is of the simplest and easiest character.

LATEST AND GREATEST IN AUTOMOBILES—PART I.

New and Novel Conceptions That Have Recently Been Born in Paris

By Thornwell Haynes, U. S. Consul.

In France, the home of the automobile, some new conceptions in the automobile line have recently made their appearance. One firm has made an automobile for the Ministry of War. It is of 15 horse power, with carriage armor-plated, carrying a Hotchkiss gun, with ammunition, and capable of 600 shots a minute. A 20-horse power machine, made by the same firm, had 4 cylinders of gun steel, each independent of the other, thus admitting of quick repairs. The admission valves were automatic and the cooling chamber of sheet copper. A 40-horse power frame had 8 cylinders and no speed-change box; a single lever changed the speed instantly.

The motors of one firm, regardless of the number of cylinders, were fitted with a water jacket around the explosion chamber. In the 1-cylinder voiturette of this same company, the admission of air was above the escapement and automatic, but in the other motors the admission valves were on the same side of the cylinder and interchangeable, while the escape valves were on the other side. Symmetrically fixed to the motor shaft and worked by cogwheels at half the speed of the motor, were the shafts which carry the cams regulating the valves. These shafts and their cams were so arranged as to be lubricated by jets of oil from the motor. On the 1-cylinder voiturette, ignition was effected by a sparking plug with induction accumulators and coil. On the other carriages of this company, the same system could be used, according to order, either for magneto-rotary lighting or by the spark system. The two systems could be placed on the same motor, so as to have a reserve sparking apparatus. On the 1-cylinder voiturette, the speed of the motor could be reduced by raising or lowering the admission valve. In the other carriages the motor was controlled by a centrifugal regulator acting on a papillon attached to the gas feed pipe. Water circulated around the cylinders by means of a centrifugal pump worked either by cogwheels or by a friction roller on the fly wheel. The water was passed through the cylinder covers and a refrigerator before returning to the pump. On the voiturette the refrigerator, which was at the front, was fitted with ailettes and the cooling effected by the displacement of the air due to the movement of the carriage. In this case, a water reservoir is indispensable. On the 2 and 4 cylinder carriages of this same firm, the cooler was partitioned and of the honeycomb type. Behind it was a ventilator worked by a strap. This arrangement had the advantage of rendering the cooling independent of the speed of the carriage and proportioned it to the power developed by the motor—that is, to the heating of the water. In this case, the reservoir was useless and a few quarts of water was all that was necessary. The gear was thrown by a friction cone. For the 1-cylinder voiturette, the possible speeds were 7, 15 and 25 miles an hour.

The new Cunarders now building are to have a speed of at least 25 knots an hour from port to port. The new ships will have a displacement of 32,000 tons, and be 750 feet in length.

Portland Now Ships Lumber to China

World's Greatest Forests to Supply a New Industry That Will Bring Vast Wealth to the Pacific Coast

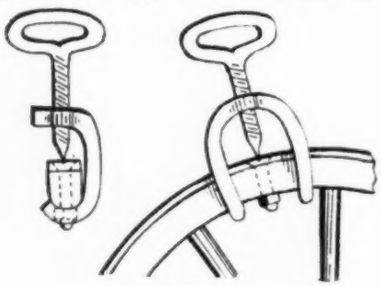
The opening up of a market in China for American lumber has added a new industry that is to bring enormous wealth to the timber regions of the Pacific coast. Portland, Ore., now the leading city in the world's greatest timber belt, is to reap the biggest share of the harvest, resulting from the Oriental trade. Washington and Oregon with their majestic forests, said to be the most beautiful in the world, excepting the Redwood districts of California, will be benefited throughout their extent. The trees of Oregon, especially the pines and firs, are remarkable in their growth, seeming designed by nature for the manufacture of lumber. Straight and comparatively free from limbs and knots there is but small waste and the profits of the saw mill are proportionately great. The accompanying illustration shows a typical Oregon forest. Last year the saw mills of Oregon reached the enormous total cut of one billion feet; the first time on record. Washington's output was 1,500,000,000 feet. In six months Portland shipped to China 16,000,000 feet of lumber. The timber of Oregon and Washington consists principally of red fir, spruce, yellow pine, hemlock, sugar pine, white pine, noble fir, silver fir, red cedar, white fir, white cedar, tamarack, oak, ash and maple.

An Oregon forest

SHOP NOTES

DEVICE TO HOLD TIRE BOLTS.

A writer in the American Blacksmith tells how to make a tire bolt holder. He calls it "la grippe." To make one, form



Tire Bolt Holder

a thumb screw ⅜ inch around, punch a hole in one end and weld in a bit of steel. Sharpen, thread and harden the point, and you have a first-class tire bolt holder. The cut clearly illustrates this tool.

INCREASING USE OF THE STEAM TURBINE.

The steam turbine, the most radical departure in steam engines that has been made in many years, is making headway at a rate not generally appreciated. In Chicago 15,000 horse-power are being installed; an electric railway in Massachusetts will use 34,000; 50,000 is to be used by an electric railway in London, while Westinghouse company has orders for 75,000 horsepower. The De Laval Company has, in America, 30,000 horse-power in operation, or nearly ready to run. Power, for March, says:

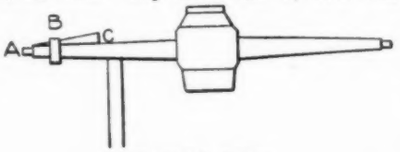
Of these, the three principal types now upon the market, the De Laval is the simplest, consisting simply of a wheel having at its periphery a series of curved blades or buckets against which one or more simple jets impinge in the same manner that the water impinges upon the buckets of a water wheel of the impact type—the Pelton, for example. All the expansion takes place in the nozzle, the contour of which is designed to utilize to the greatest extent the lateral expansion in inducing linear velocity. The velocity of the jet is therefore very high, and as the speed of the buckets should be in the vicinity of one-half that of the jet, the rotative speed is such that it has to be reduced by gears to make it applicable to ordinary purposes, although it is direct connected to centrifugal separators, pumps and fans.

The Parsons turbine consists of alternate series of fixed and movable vanes, of gradually increasing section, so that the steam passes from one series to another with only enough difference in pressure to induce a flow at a comparatively moderate velocity, the expansion proceeding gradually from one end of the machine to the other. It is an impressive lesson in the conversion of heat into power to stand beside one of these machines, into the smaller end of which steam enters at over 400 degrees, and out of the larger end of which, but a few feet away, it passes at but little over 100.

The Curtis turbine, the latest of the three types, is, so far as we have been able to learn, a sort of combination of the two others. The steam is, as we understand it, allowed some initial expansion in nozzles, as in the De Laval, and before it strikes the first series of blades has already acquired a considerable velocity. The first wheel dealing with steam which has been already somewhat expanded, is larger than the high-pressure end of a Parsons turbine of similar capacity, and is made so large that notwithstanding the increased velocity due to the initial expansion the rotative speed is even slower than in the Parsons. Some ten initial nozzles are used and the governing is accomplished by cutting them out successively with perhaps provision for varying the capacity of one, or throttling, as in the De Laval. The Parsons is governed, it will be remembered, by making the admission intermittent.

A GOOD METHOD OF DRAWING OLD SPOKES.

To draw old spokes, says the American Blacksmith, make three or four bands about 1½ to 3 inches out of 1½ inch band iron. Slip the band B, over the



Drawing Old Spokes

spoke A, then fit a good hickory wedge C, inside the band next the spoke and drive on the wedge. It's a very bad spoke which cannot be hammered out by this plan.

SHARPENING AND TEMPERING MILL PICKS.

The following item will be found very useful to any man who has coal picks to sharpen or temper. The method explained will make them as hard as a diamond on the point, says a writer in the American Blacksmith. A coal pick sharpened like a needle is not effective. The point should be of a small square section, being flattened out at the extreme end, so that it will not stick in the coal when driven. The harder the point, of course, the better it will cut.

Pour turpentine into a tin pan until it is about an eighth of an inch deep. After hardening the point, place it straight up and down in the turpentine and hold it until it is chilled. Then dip the pick in water to cool it off, and do not allow the temper to run. This will give a small, hard shell on the very point, and the pick will do good service. I have seen picks tempered in this way last four times as long as others. I think the process would be well worth trying, to any one who has this kind of work to do.

The simplest and most effective method of draining irrigated land is a ditch, either open or closed, constructed across the slope where seep water first manifests itself, parellel with the supply ditch and between it and the injured land. Whatever subsequent work may be found necessary, this is the first step.

HINTS TO INVENTORS.

Here's a chance to earn $3,000. The St. Louis World's Fair offers that amount in cash for the successful transmission, electrically, without wires, of only one-tenth of one-horse power, a distance of 1,000 feet.

A SUGGESTED COHERER.

Those of our readers who are experimenting with wireless telegraphy will be interested in the following from the London Electrical Review:

The Castelli coherer is probably the most simple appliance of its kind in use, but it seems to me that a better, and equally simple, coherer could be constructed in the following manner:—Take two fiddle strings (G) and place them at right angles to one another, thus

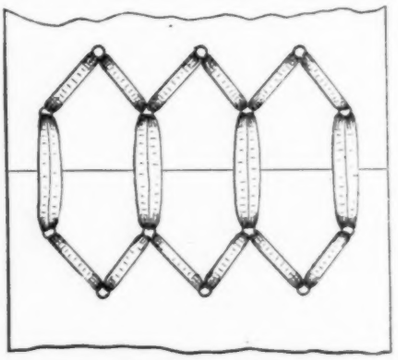
+

These strings, as is well known to musicians, are made of gut about the thickness of an E string, and covered with fine wire of copper or silver.

At the point where they touch they could be amalgamated with mercury, or rubbed with powdered carbon or plumbago or small blocks of metal or carbon, with or without a mercury film between, might be affixed to the strings at the points of intersection, which naturally need not be exactly in the middle of the strings. Again, one string only may be employed, abutting against a piece of metal or carbon, with or without mercury. They can be screwed up, as on a violin or other kinds of stringed instruments, to any pitch by means of pegs, and in this position of tension they can be made exceedingly sensitive in their motion. The fine wire, moreover, gives a certain amount of resistance, because although the spirals touch, they become oxidized.

A DURABLE BELT LACING.

The proper way to lace a belt is a subject on which there is a diversity of opinion among engineers and power users, and nearly every one appears to believe his own way is the best. It is claimed that the method shown in the



Durable Belt Lacing

drawing is the result of long experience and is one that will last from three to five years. It will be noticed that the lace is double over the joint and single on the outside of the back.

The German East African cotton enterprise is to be developed on broad lines by founding an agricultural school and settling American cotton farmers on the land.

CURIOSITIES OF TEMPERING.

Take a piece of hardened steel, a piece of soft steel and a piece of iron, all of the same size and thickness; polish them and lay the three side by side on a copper plate; heat the plate and watch the color changes which take place. The hardened steel will be affected first and will take on the first tempering color, straw. When the iron attains a straw color, the soft steel will have passed through the various colors to pink, and the hardened steel will have passed through all the tempering colors to blue. Thus in the same interval of time the three substances will have each reached a different color.

Alois Platt.

Can any of our readers tell why?

AN IMPROVED BLOW PIPE.

Inventive ingenuity has been much exercised in the improvement of the blow pipe. Our illustration from the Keystone shows a new blow pipe outfit. To light it the workman places his foot on the blower and puts a match to the blow pipe. The result is an immediate brush or needle-point flame, which is regulated by means of a thumb valve on the blow pipe. The pressure from the foot blower creates a vapor, mixing the air at the same time, which creates pure combustion. The base is made of heavy glass and the other parts of brass, nickel plated.

New Blow Pipe Outfit

The top arm is so arranged that it can be adjusted to any position. The outfit is simple in construction and is claimed to be perfectly safe. The carburetor is quite ingenious in its simplicity. There are no cocks to turn off or on, no trouble with the gasoline and, indeed, objectionable features of all kinds seem to have been successfully eliminated. The foot-blower is strongly made, has the springs on the outside, folds up into small space and yet has considerable capacity.

STEAM BOILER ECONOMY.

The principles affecting the economy of steam boilers are so simple and well recognized that it seems almost incredible that we have not made more progress than we have during the past century, says the Engineering Magazine. Notwithstanding all the elaborate experiments and investigations of our scientific men, we still hang the kettle on the crane, so to speak, and let it absorb what heat it can before the gases go up the big chimney.

For a number of years no advance has been made in the efficiency of the boiler plant. I am not unaware that this statement will be disputed by inventors and other interested parties; nor do I wish to be understood to say that some of these so-called improvements are not correct in principle, and more or less so in application. I am speaking of the general practice of the day. We still, after many years, and the introduction of expensive equipment, find our boiler plant running on 70 per cent efficiency. What becomes of the other 30 per cent, and how can it be saved? About 1 per cent is in the ash, 6 per cent is radiated, and 23 per cent goes up the chimney for one cause or another. From a scientific standpoint, it is easy to see how to remedy the first two items.

SAVING TIME IN THE DRAFTING ROOM BY THE USE OF TRACING PAPER.

I enclose you herewith an original drawing made on tracing paper in soft pencil (3 H is about right), also a blueprint made from it, says a correspondent in the American Machinist. As you will see, while not having the clear white lines of the blue-print made from the ordinary inked tracing, it is yet quite clear enough for all purposes for which a blueprint is used. The many uses of and the saving of time by this process, as well as the ease with which revisions and corrections can be made, will be obvious to any person who has been through the usual one of first drawing on paper and then tracing in ink on tracing cloth before blueprints can be gotten into the shop. I have used this scheme with very great advantage in getting out experimental work of which I had charge and which it was important to have going in the shortest possible time. In many cases I have been able to have the more important frame castings, brackets, etc., traced directly from the original construction design of the machines, thereby saving most of the time usually consumed in redrawing and tracing before a blueprint would be available.

EXHAUST STEAM FOR SMOKE PREVENTION.

A simple, and what is claimed to be a practical solution of the smoke nuisance, or at least a good part of it, as well as a positive saving in fuel is thus described by a contributor to Steam Engineering:

I tapped into my exhaust pipe and from it ran a 1½-in. pipe to the boiler front, where I cut a hole about six inches below the grate line. Through this hole I passed the 1½-in. pipe into the ash pit and across the boiler front about six inches below the grate. In the cross pipe ½-in. holes were drilled at 4-in. intervals. Before firing any fresh coal I turned on the exhaust steam, which, issuing from the holes in the perforated pipe, passed up through the grate which was left bare of coal or ashes for eight or ten inches, clear across the front. The exhaust steam saturated the smoke, causing it to become heavy enough to linger and be consumed. Now, as smoke is unconsumed carbon, and since exhaust steam may be said to cost nothing in a case like this, my method of curing the smoke nuisance really effected a considerable economy of fuel.

The use of steam jets has been a much-mooted problem, and I cannot say I believe the ordinary live-steam jet to be economical in the least, but I do claim that my system, as already described, is not injurious, is a money saver, and will remove the wrinkles from the brow of many a puzzled engineer who gives it a fair trial. If there are any bad points about it I have not as yet discovered them. It is fully worthy a careful trial, and certainly is the smoke consumer which fills the bill in my case.

HOME MADE PILOT LIGHT FOR AUTO GENERATORS.

A correspondent in the Motor Age says:—I procured the top of a plumber's torch, such as used for thawing out pipes, or which painters use to burn off old paint, a few short pieces of ⅛-inch brass pipe and one union joint. Under my direction the "handy-man" at a repair shop put in a T joint between the main burner and the torch joint in the gasoline pipe. The rear opening or "peep hole" in the side of burner casing was then enlarged enough to let the end of the plumber's torch enter. This was pointed in such a way that it would direct the blaze against the gasoline supply pipe as it came down from the boiler and turned outward to the supply nozzle. The pipe from the T was carried down below the nozzle and then back to the torch, with the union joint on the horizontal part to hold the torch in place as well as to supply the fuel to it.

After the torch was in place I had the tinner make a little square box to fit over the torch and with a door in the middle to open when lighting. From the fuel cock for supplying the torch, I had a short piece of pipe put in with the lower end resting in the cup of my new torch. In operating, I first allow the cup to fill up below the torch, by allowing it to run through the last pipe mentioned. I then light this and it heats the torch, which can then be turned on by the handle the same as when used by a plumber. After the blaze has been going a short time I turn on the main burner and do not have to watch it every minute as when firing by the old torch system.

When I leave my carriage to stand for some time, I turn off the main burner and leave the torch burning a medium blaze. After 2 hours I will generally have 30 or 40 pounds of steam and will not find the water all gone from boiler, as when main burner is on. Thus I can start in a couple of minutes. I find, also, that I do not have trouble with backfiring with this apparatus, nor with blowing out of the burner in a high wind, while the slight noise it makes when burning alone is a very small objection to the many useful points I have found in it after a year's use. The total cost of this generator and pilot light was about four dollars.

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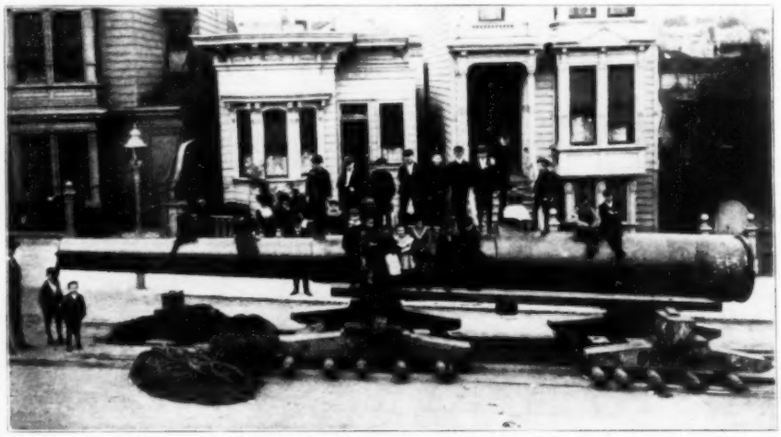
Great Guns Guard the Golden Gate

Queen City of the Western Seas Now Protected by Three Monster Cannon

Whenever an enemy comes within a radius of ten miles of Point Bonita, San Francisco, he will become a target for all of three monster guns that have just been stationed there to guard the entrance to San Francisco. It was recently decided by the army authorities that our "Queen City of the Western Seas" was not properly fortified against a possible attack of some maritime foe that might sweep down from across the Pacific and try to do her harm. But San Francisco with her other fortifications and these three colossal guns pointing out toward the setting sun feels as secure as a babe in its mother's arms.

The guns weigh 80 tons each, and cost nearly $300,000. They have just completed their eventful trip across the continent from Sandy Hook. They made the journey unmounted, and everywhere were the object of the curious gaze of wondering crowds. The guns are 12-inch bore and 30 feet long. They are disappearing guns of the latest pattern and are known as the most destructive fire-arm manufactured. Tests with the same type of weapon have been described in recent issues of Popular Mechanics. There is no ship that floats that they cannot demolish when it comes within their range. The illustration shows one of the guns as it was being taken from the car through the streets of San Francisco.



12-Inch Coast Defence Gun, the Most Powerful Type in Existance.

FAULTS OF TELEPHONES.

How to Tell What is the Matter When Troubles Occur.

By C. W. Farr, President of the Farr Telephone and Construction Co.

Few persons, when their telephone gets out of order, know what is the matter with it. The best telephone made will often become impaired. Here are a few points that will doubtless enable you to determine where the fault lies when such troubles occur:

1. Can hear but cannot be heard—This fault is frequently caused by leaving the receiver off the switchhook, after the conversation is ended, the neglect resulting in the premature exhaustion of the battery.

2. Can hear at both ends, but can ring one way only—This may result from a weak battery at one end, or the bell at the faulty end may be out of adjustment.

3. Can ring in both directions, but cannot hear at either station—This may result from a broken receiver cord, or from a disconnected wire in some other part of the secondary (or speaking) circuit at one end only.

4. Ringing and speaking alike unsatisfactory—This may result from weak batteries at both ends, or from a bad joint or bad earth connections.

5. Hearing bad, with rasping noises—This may result from either of several causes—a loose joint, rust or buckled diaphram, or excessive battery power in microphone circuit.

Noises in one receiver only—This will probably result from one or more particles of iron having been attached to the poles of the magnet, the diaphraghm's vibrations being interfered with in consequence. To remedy this, unscrew receiver cap and wipe off magnet cap.

Badly soldered joints, loose terminals, dirty contacts, broken battery jars, and terminals short circuited, are also frequently causes of local faults.

Line making partial earth will cause ringing and speaking to be alike unsatisfactory.

Line faults may be caused by two or more lines in contact, by the line making partial or dead earth or by a broken wire or insulator.

Lines in contact will result in cross talk and bells ringing when not required.

Will some reader give me in Popular Mechanics the best method of finishing off a tool chest inside?—W. N. P., Wilton, N. H.

Will some reader give suggestions?

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A MODERN LOVE SONG.

In the state of Mass.
There lives a lass
I love to go N. C.;
No other Miss.
Can, e'er I Wis.
Be half so dear to Me.

R. I. is blue,
And her cheeks the hue
Of shells where waters swash;
On her pink-white phiz
There Nev. Ariz.
The least complexion Wash.

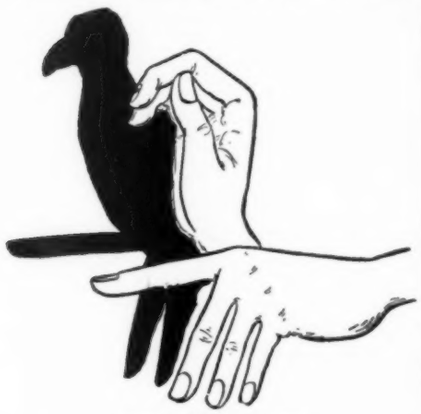
La.! could I win
The heart of Minn.,
I'd ask of nothing more.
But I only dream
Upon the theme,
And Conn. it o'er and Ore.
Why is it, pray,
I can't Ala.
This love that makes me Ill.?
N. Y., O., Wy.,
Kan. Nev. Vir. I
Propose to her my will?

I shun the task
'Twould be to ask
This gentle maid to wed;
And so, to press
My suit, I guess
Alaska Pa. instead.

—Brooklyn Eagle.

SHADOW PARROT.

Making shadows on the wall to represent birds and animals is yet a favored amusement among young people in many



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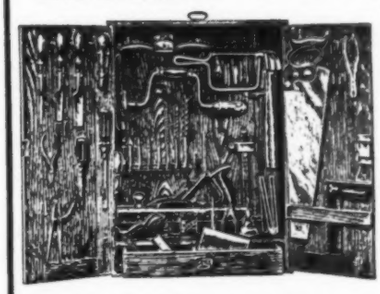

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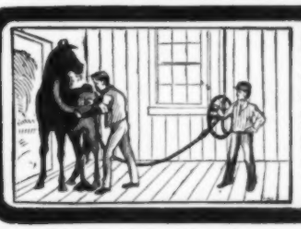

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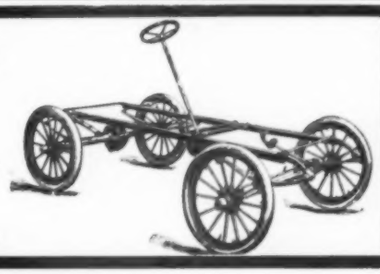

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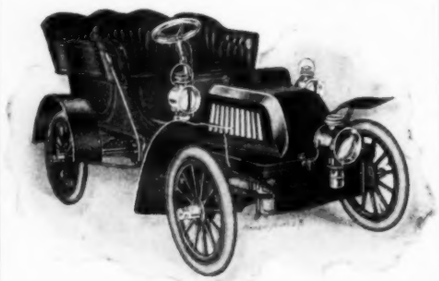

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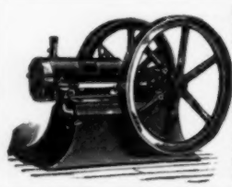

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The first serious attempt at a long distance voyage, says the Aeronautical World, was made in 1785, when, on June 15, M. Pilatre de Rosier, accompanied by a young gentleman named Romain, ascended at Boulogne-sur-Mer with the intention of crossing to England, but unfortunately the attempt failed through the balloon's catching fire and the adventurous occupants of the car were dashed to pieces and killed on the rocks between Boulogne and Calais. The first long distance voyage, however, took place in England three months before M. Pilatre's attempt, when Sir Edward Vernon and Count Zambeccari made an ascent in London, and succeeded in traveling over thirty-five miles, landing at Horsham in a little over an hour after leaving London.

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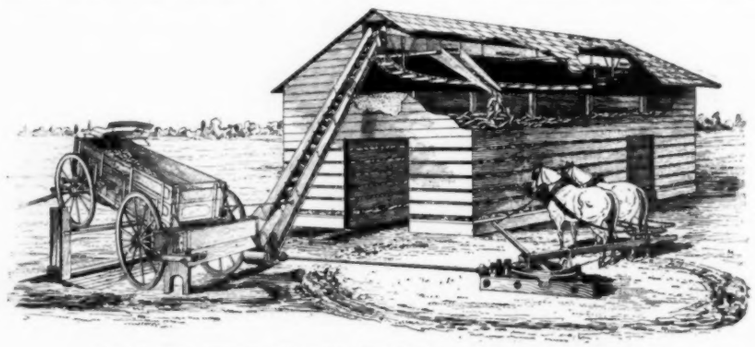

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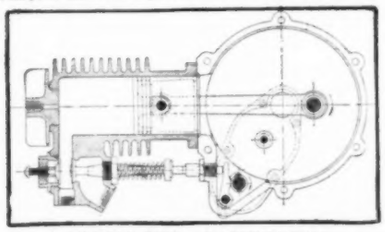

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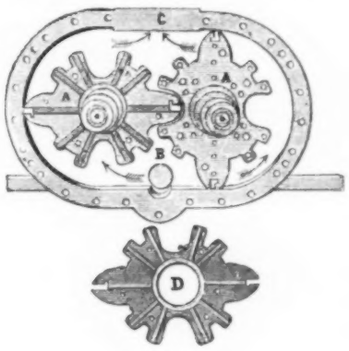

Fig. 1.

force lies in the novel construction of the pumping apparatus, shown in the accompanying illustrations. Fig. 1 represents a section of the engine-case. AA are cams. B is the inlet for steam, and C the exhaust. The direction taken by the steam in passing through the engine is shown by the arrows. D is one of the packing plates, removed from the cam, reversed to show the square ribs which fit neatly into the corresponding grooves in the end of the cam. Small spiral brass springs are set into the bottom of the grooves to prevent the plate from getting set by oil accumulations; the moment the steam is let on, it rushes

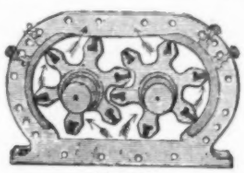

Fig. 2.

into the spaces between the ribs, and presses the plate against the head, keeping the heads perfectly steam-tight, and allowing for expansion and wear. Similar strips are set in the ends of the long arms of the cams, and serve to keep the cases steam-tight.

Fig. 2 represents a section of the pump. The cams are similar to the engine cams, except that they have six arms, each bearing on the case; they are driven by the engine in the direction indicated by the arrows, which also show the course of the water through the pump. The sides of the cams are provided with removable plates, upon which most of the wear of the cams comes; these plates are counter-bored at the bottom, and prevent the cams from "pounding," when doing heavy work. They may be depended upon for long years; but, if cut out by hard usage, can be renewed cheaply, thereby saving the case.

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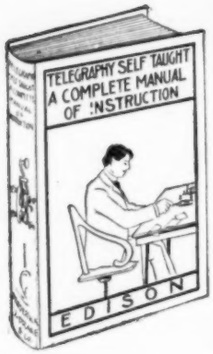

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